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PCT

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: A DETERGENT FOR USE IN AN AUTOMATIC DISHWASHER		
(57) Abstract <p>A detergent for automatic dishwashing apparatus is disclosed which is used in the form of a detergent-containing package, the package being constituted of a water-permeable membrane and eventually airtightly sealed. The detergent thus packaged is conducive to automatic cleaning of dishes even with relatively small dishwashers and also to safety without direct contact with the detergent, and moreover, is free from tedious replenishment of the detergent at every cleaning cycle and overweight feeding of the detergent or insufficient cleaning.</p> <div data-bbox="760 1205 1110 1436"></div>		

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DESCRIPTION

A DETERGENT FOR USE IN AN AUTOMATIC DISHWASHER

Technical Field

5 This invention relates to a method of washing dishes clean with the use of a dishwashing apparatus. More particularly, the invention relates to such a cleaning method suitable for use in automatic dishwashers of a relatively small-scale type set in
10 individual households or small stores.

Background Art

 In order to wash clean those dishes and glasses which have been used to serve customers with meals and
15 drinks, automatic dishwashing apparatus have heretofore been employed in hotels and also in large stores or establishments such as restaurants and the like that are utilized by a large number of customers. Common practice lies in dissolving a certain particulate or
20 liquid detergent composed predominantly of strong alkalis such as sodium hydroxide and potassium hydroxide, followed by feeding of the resultant solution into a dishwasher and by subsequent manipulation of the apparatus to clean used dishes.

25 The above automatic dishwasher is provided with sensor means for sensing the cleaning concentration within the apparatus to thereby permit successive feeding of the detergent into the apparatus as the

cleaning concentration is becoming too low for detergency. This is a so-called self-feeding system.

In recent years, however, automatic dishwashers of a relatively small-scale type have been highly reputed for household use or for installation in small-sized stores. Such a small dishwasher, unlike one of a large type, is generally devoid of a self-feeding system since the latter is rather spatial and moreover costly. Hand feeding of a detergent, therefore, is required in the case of the small dishwasher, and this feeding is performed by putting a selected amount of a detergent into that apparatus every time dishes are washed clean, or by placing en masse a detergent in a quantity corresponding to several cleaning batches and depending upon the user's experience. Here, the amount of the detergent to be fed by hand relies upon the user's discretion, thus producing a major effect upon the resultant cleaning concentration.

Too small feeds of a detergent lead to reduced concentration of the detergent and hence fail to attain sufficient detergency, entailing repeated cleaning. Too large feeds of a detergent cause increased concentration of the detergent with the result that certain detergent components remain unremoved on the inner and outer sides of the respective dishes and glasses. In this instance, additional rinsing is needed to fully wash down those residual detergent components from the dishes.

Furthermore, the detergent when fed in a large amount is not sufficiently dissolvable and hence liable to get partially deposited at the bottom of the dishwasher with eventual reduction in detergency. A
5 highly concentrated detergent fluid poses another problem as regards drainage disposal.

Relatively small automatic dishwashers are accompanied by various problems noted above.

10 Disclosure of Invention

To eliminate the above stated drawbacks of the automatic dishwashers of a small type, the present invention contemplates the use of a detergent that is highly capable of washing dishes clean with utmost ease
15 and high efficiency even omission of a self-feeding system as is usual with dishwashers of a large type.

The present invention has been completed through intensive research made by the present inventor in an effort to achieve the object stated above. More
20 specifically, the invention provides a detergent for automatic dishwashing apparatus which is used in the form of a detergent-containing package, the package being constituted partly or wholly of a water-permeable membrane.

25 Packages eligible for the present invention are each formed at its partial portions or in its entirety of a membrane or membranes permeable to water. In its surface area of not smaller than 10%, each such package

is accounted for by the water-permeable membrane and formed at its remaining portion of a water-impermeable material such as polyethylene, polyvinyl chloride or the like in common use. The ratio of water-permeable
5 membrane to package surface area can be in the range of 10 to 100% to suit particular application of the package.

Suitable water-permeable membranes are chosen from among a film- or plate-like membrane derived from a
10 conventional thermoplastic resin and having a thickness of several microns to about 1,000 microns, a membrane made available from a woven fabric of a natural fiber such as hemp, cotton or the like, and a membrane derived from a nonwoven fabric of nylon, polyesters or
15 the like.

The above exemplified membranes can be rendered by nature permeable to water as they are, or by mechanical treatment. Permeability to air may be taken as a measure of the water permeability of each of these
20 membranes. In general, air permeations of greater than 0.1 cc/cm²/sec are satisfactorily applicable to the present invention. The water permeation of the membrane is determinable with the amount of or the dissolution of a detergent to be used.

25 In the foregoing package is accommodated a given detergent to provide a detergent-containing package according to the invention. Eligible detergents are those of a particulate, granular, slurry or solid form

commonly known for use in automatic dishwashers.

Such detergents may be produced by the use of inorganic alkaline salts such as sodium hydroxide, potassium hydroxide, silicic acid salts and the like, nonionic surfactants, water-soluble polymers such as sodium poly-acrylate, carboxyl methyl cellulose and the like, chelating agents such as nitrilotriacetic acid salts, ethylenediamine-tetraacetic acid salts and the like, and phosphorus compounds such as sodium pyrophosphate, sodium tripoly-phosphate and the like. Any detergent generally useful for automatic dishwashers may be appropriate for the practice of the present invention.

The package for use in the present invention is not particularly restrictive in its shape so long as it is capable of adequately receiving a selected detergent therein. For instance, the package may be of a box- or bag-like shape. The detergent-containing package according to the invention is applicable in its different configurations as shown in Fig. 1 through Fig. 6. In Fig. 1 is illustrated one preferred package form in which a water-permeable membrane is disposed to assemble a membrane package in its surface area of greater than 10%. In another package form, as seen in Fig. 2, the package is provided in its entirety, i.e. in its surface area of 100%, with the same membrane as in Fig. 1. Figs. 3 and 4 represent the use of a dual bag structure for package formation, Fig. 3 being

directed to a package having an inner membrane inside the membrane package shown in Fig. 1, and Fig. 4 to a package having an inner membrane inside the membrane package shown in Fig. 2. The inner membrane used here
5 is more pervious to water than the outer membrane, and the area of the outer membrane can preferably be larger by 1.1 times or more than the inner membrane. The detergent may be put into the inner portion inside the inner membrane or into the interlayer between the inner
10 and outer membranes (the interlayer being hereunder referred to simply as an outside layer). Detergent feeding, though usually equal in the inner portion and in the outside layer, should preferably be smaller in the outside layer than in the inner portion, say in a
15 ratio of not more than 2 : 3. Moreover, an internal partition membrane may be located centrally transversely of each of the packages shown in Figs. 1 to 4 such that the finished package is provided with an upper and a lower compartment. Hence, the detergent
20 may be placed in the two compartments and can be adjusted in its individual rates of dissolution. Although detergent feeding is made equal in both compartments, a smaller feed in the upper compartment than in the lower compartment is preferred in a ratio
25 of less than 2 : 3.

The upper compartment, central portion and lower compartment of the package may be structurally identical or different in implementing the present

invention. In addition, the internal partition membrane positioned centrally of the package may be pervious or impervious to water.

Fig. 5 represents a typical form of the package shown in Fig. 1 and modified to have an internal partition membrane held in place. Fig. 6 represents a typical form of the package seen in Fig. 2 and modified to have a central partition membrane disposed therein.

In Figs. 1 to 6, like reference numerals denote like parts or materials. Designated at 1 is a detergent-containing package, at 2 a water-permeable membrane, at 2a an outer water-permeable membrane, at 2b an inner water-permeable membrane, at 3 a water-impermeable membrane, at 4 a detergent for use in automatic dishwashers and at 5 a central internal partition membrane.

As discussed hereinabove, dishes can be automatically washed clean by the application to automatic dishwashers of the detergent-containing package according to the present invention. Suitable automatic dishwashers are such of a volume below 50 liters for household use or for installation in small-sized stores. The package is usually from 100 to 2,000 cc in volume, and the packaged detergent is from 100 to 2,000 g in amount.

Brief Description of the Drawings

Fig. 1 is a view showing a first preferred form of

the detergent-containing package according to the present invention.

Fig. 2 is a view showing a second form of the detergent-containing package according to the invention.

Fig. 3 is a view showing a third form of the detergent-containing package according to the invention.

Fig. 4 is a view showing a fourth form of the detergent-containing package according to the invention.

Fig. 5 is a view showing a fifth form of the detergent-containing package according to the invention.

Fig. 6 is a view showing a sixth form of the detergent-containing package according to the invention.

Description of Preferred Embodiments

With reference to the following examples, the advantages of the present invention will be described in greater detail. These examples should be regarded as illustrative but not restrictive.

Example 1

A cotton fabric (air permeability: 150 cc/cm²/sec) dimensioned to be 18 x 36 cm was centrally folded into two, followed by peripheral sealing with a part left open, thereby forming a bag-like package. An alkaline

particulate detergent (Optimum 105; Johnson Co., Ltd.) was fed in an amount of 1,000 g into the resulting package through the opening or inlet. Airtight sealing of the inlet gave a detergent-containing package
5 (detergent 1).

Example 2

The procedure of Example 1 was followed except that a rayon fabric (air permeability: 200 cc/cm²/sec) of 18 × 36 cm. Thus, there was obtained a
10 detergent-containing package (detergent 2).

Example 3

The procedure of Example 1 was followed except that a polyester-polypropylene nonwoven fabric (air permeability: 130 cc/cm²/sec) of 18 × 36 cm. Thus,
15 there was obtained a detergent-containing package (detergent 3).

Example 4

An alkaline particulate detergent (Optimum 105; Johnson Co., Ltd.) in an amount of 1,000 g was put into
20 a bag (water-permeable membrane: 50% in a surface area of the bag) provided on one side with a nonwoven fabric (air permeability: 1 cc/cm²/sec) fabricated by needle punching of a polypropylene sheet of 15 × 15 cm and on the other or opposite side with a polypropylene
25 nonwoven fabric (air permeability: 0.1 cc/cm²/sec) sized to be 15 × 15 cm and derived from spun bonding and melt blowing. The bag was then airtightened by heat sealing. Thus, there was obtained a

detergent-containing package (detergent 4).

Example 5

An amount of 1,000 g of an alkaline particulate detergent (Optimum 105; Johnson Co., Ltd.) was placed
5 in a bag (water-permeable membrane: 17% in a surface area of the bag) having on one side a sheet of 18 x 18 cm, the sheet being composed at its central portion of 6 cm in width of a polyester-polypropylene nonwoven fabric (air permeability: 130 cc/cm²/sec) and at its
10 both ends of a polyethylene terephthalate-polyethylene sheet, the bag having on the other or opposite side a polyethylene terephthalate-polyethylene sheet of 18 x 18 cm. Upon airtightening of the bag by heat sealing, there was obtained a detergent-containing package
15 (detergent 5).

Example 6

Into a bag (water-permeable membrane: 50% in a surface area of the bag) provided on one side with a polyester-polypropylene nonwoven fabric (air
20 permeability: 130 cc/cm²/sec) of 15 x 15 cm and on the opposite side with a polyethylene sheet of 15 x 15 cm was put 1,000 g of an alkaline particulate detergent (Optimum 105; Johnson Co., Ltd.). Airtightening of the bag by heat sealing gave a detergent-containing package
25 (detergent 6).

Example 7

A polyester-nylon nonwoven fabric (air permeability: 1 cc/cm²/sec) dimensioned to be 18 x 36 cm

was centrally folded into two and then peripherally sealed with a part left open, thereby forming a bag. An alkaline particulate detergent (Optimum 105; Johnson Co., Ltd.) was put in an amount of 900 g into the bag
5 through the inlet or opening, after which the inlet was airtightened by heat sealing. The bag was thereafter covered or otherwise wrapped with another polyester-polypropylene nonwoven fabric (air permeability: 130 cc/cm²/sec) of 20 x 40 cm, followed by
10 peripheral sealing of the nonwoven fabric with a part left open, thereby forming an outer bag with an outside layer. A similar detergent (Optimum 105; Johnson Co., Ltd.) was put in an amount of 100 g into the outside layer through the opening which was then heat sealed.
15 Thus, a package (detergent 7) was obtained which contained the detergent in an amount of 100 g in the outside layer and in an amount of 900 g in the inner portion.

Example 8

20 A polyester-nylon nonwoven fabric (air permeability: 1 cc/cm²/sec) dimensioned to be 18 x 36 cm was centrally folded into two and then peripherally sealed with a part left open to thereby form a bag. An alkaline particulate detergent (Optimum 105; Johnson
25 Co., Ltd.) was fed in an amount of 900 g into the bag through the inlet or opening, after which the inlet was airtightened by heat sealing. The bag was thereafter covered or wrapped with a sheet of 20 x 40 cm derived

from a polyester-polypropylene nonwoven fabric (air permeability: 130 cc/cm²/sec) of 20 x 20 cm and a polyethylene sheet of 20 x 20 cm, followed by peripheral sealing of the first-mentioned sheet with a part left open, thereby forming an outer bag with an outside layer. A similar detergent (Optimum 105; Johnson Co., Ltd.) was put in an amount of 100 g into the outside layer out of the opening which was then heat sealed. Thus, a package (detergent 8) was obtained which contained the detergent in an amount of 100 g in the outside layer and in an amount of 900 g in the inner portion. The water-permeable membrane of the outside layer was equivalent to a surface area of 50% of the outside layer in the package.

15

Example 9

A bag-like package was used which was provided on one side with a polyester-nylon nonwoven fabric (air permeability: 1 cc/cm²/sec) of 18 x 18 cm and on the opposite side with a polyester-polypropylene nonwoven fabric (air permeability: 130 cc/cm²/sec) of 18 x 18 cm and further at a central position with a partition membrane of a polyester-nylon nonwoven fabric. An alkaline particulate detergent (Optimum 105; Johnson Co., Ltd.) was put in an amount of 100 g into one portion of which outer wall is formed of the polyester-polypropylene fabric, namely an upper compartment, and in an amount of 900 g into the other portion of which outer wall is formed of the

polyester-nylon fabric, namely a lower compartment, respectively, through the respective inlets or openings. Heat sealing of the inlets led to a package (detergent 9) containing the detergent in an amount of 100 g in the upper compartment and in an amount of 900 g in the lower compartment.

Example 10

A bag-like package was used which was provided on one side with a polyester-nylon nonwoven fabric (air permeability: 1 cc/cm²/sec) of 18 x 18 cm and on the opposite side with a polyester-polypropylene nonwoven fabric (air permeability: 130 cc/cm²/sec) of 18 x 18 cm and further at a central position with a partition membrane of polyethylene. An alkaline particulate detergent (Optimum 105; Johnson Co., Ltd.) was put in an amount of 100 g into one portion of which outer wall is formed of the polyester-nylon fabric, namely an upper compartment, and in an amount of 900 g into the other portion of which outer wall is formed of the polyester-polypropylene fabric, namely a lower compartment, respectively, through the respective inlets or openings. Heat sealing of the inlets led to a package (detergent 10) containing the detergent in an amount of 100 g in the upper compartment and in an amount of 900 g in the lower compartment.

Performance evaluation was made of detergents 1 to 10 obtained in Examples 1 to 10 with a set of test conditions indicated below.

Put to use was an automatic dishwasher (50B Type; volume: 50 liters; Hoshizaki Co., Ltd.). Dishes and glasses to be cleaned and each of detergents 1 to 10 and a certain particulate detergent as it was or as
5 unpackaged (Comparative Example; detergent 11; Optimum 105; Johnson Co., Ltd.) were located in place on a boundary plate (a strainer) mounted atop a cleaning tank of the apparatus. Operation was effected at a temperature of 70 °C and at a cycle of 45 seconds for
10 cleaning and of 15 seconds for rinsing. The concentration of each detergent was checked by measuring, at every cleaning cycle, the cleanability of the dishes and the alkalinity of the cleaning solution in the apparatus with the results tabulated hereunder.

15 The concentration of the detergent (Det. Conc.) is usually in the range of 0.1 to 0.3% by weight which is most preferable in respect of detergent action and drainage disposal. Concentrations of greater than 0.3% by weight invite adverse deposition of the detergent on
20 the surface of each dish and glass as well as inconvenient drainage.

Detergency was adjudged by the degree required for dirt attached to dishes to be removed according to the following criteria.

25 O: larger than 80%
Δ: 40 to 80%
x: smaller than 40%
detergent residue: detergent components having

remained unremoved on dishes
and glasses

Table 1

	deter- gent	cleaning cycle	1	2	3	4	5	10	20
Example 1	1	detergent concentration	0.17%	0.19%	0.21%	0.23%	0.25%	0.26%	0.23%
		detergency	○	○	○	○	○	○	○
Example 2	2	detergent concentration	0.20%	0.25%	0.27%	0.30%	0.28%	0.27%	0.25%
		detergency	○	○	○	○	○	○	○
Example 3	3	detergent concentration	0.18%	0.25%	0.25%	0.26%	0.30%	0.27%	0.25%
		detergency	○	○	○	○	○	○	○
Example 4	4	detergent concentration	0.18%	0.20%	0.22%	0.23%	0.23%	0.22	0.20%
		detergency	○	○	○	○	○	○	○
Example 5	5	detergent concentration	0.13%	0.15%	0.17%	0.19%	0.20%	0.19%	0.18%
		detergency	○	○	○	○	○	○	○
Example 6	6	detergent concentration	0.15%	0.18%	0.20%	0.21%	0.21%	0.22%	0.23%
		detergency	○	○	○	○	○	○	○
Example 7	7	detergent concentration	0.14%	0.16%	0.18%	0.19%	0.19%	0.18%	0.17%
		detergency	○	○	○	○	○	○	○
Example 8	8	detergent concentration	0.15%	0.17%	0.18%	0.20%	0.20%	0.20%	0.19%
		detergency	○	○	○	○	○	○	○
Example 9	9	detergent concentration	0.14%	0.18%	0.18%	0.20%	0.22%	0.20%	0.19%
		detergency	○	○	○	○	○	○	○
Example 10	10	detergent concentration	0.13%	0.16%	0.18%	0.20%	0.20%	0.19%	0.19%
		detergency	○	○	○	○	○	○	○
Compara- tive Example 1	11	detergent concentration	0.80%	0.42%	0.23%	0.14%	0.05%	<0.1%	<0.1%
		detergency	deter- gent residue	deter- gent residue	○	○	△	×	×

By use of the detergent of the present invention in the form of a detergent-containing package, automatic cleaning of dishes can be performed even with an automatic dishwashing apparatus of a relatively
5 small type. Tedious replenishment of the detergent at every cleaning cycle is obviated on the part of the user, and overweight feeding of the detergent or insufficient cleaning is prevented. These advantages are of great industrial significance.

10 Also advantageously, safety is ensured without the need for direct contact with the detergent itself.

CLAIMS

1. A detergent for automatic dishwashing
apparatus, said detergent being used in the form of a
detergent-containing package, said package being
5 constituted partly of a water-permeable membrane.

2. A detergent for automatic dishwashing
apparatus, said detergent being used in the form of a
detergent-containing package, said package being
10 constituted wholly of a water-permeable membrane.

3. The detergent according to claim 1 or 2,
wherein said package is of a multi-ply structure having
at least two layers, each of said two layers being
15 provided with a water-permeable membrane, the
water-permeable membrane disposed outwardly of the
package being more previous to water than the
water-permeable membrane disposed inwardly of the
package.

20

4. The detergent according to claim 1 or 2,
wherein said package is provided with an internal
partition membrane.

25

5. The detergent according to claim 4, wherein
said package is of a multi-ply structure having at
least two layers, each of said two layers being
provided with a water-permeable membrane, the

water-permeable membrane disposed outwardly of the package being more previous to water than the water-permeable membrane disposed inwardly of the package.

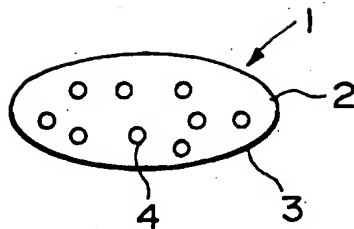


FIG. 1

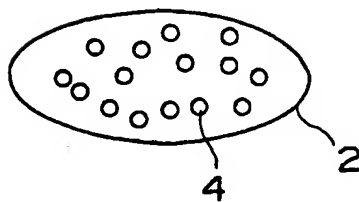


FIG. 2

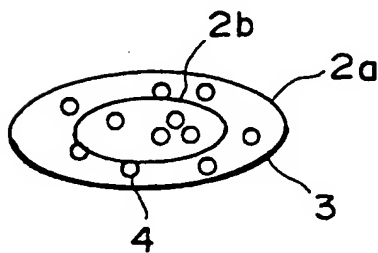


FIG. 3

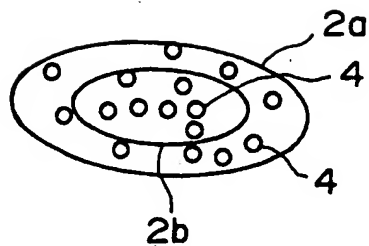


FIG. 4

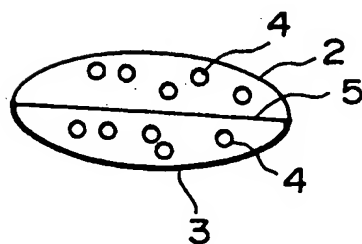


FIG. 5

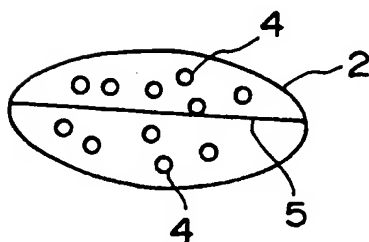


FIG. 6

INTERNATIONAL SEARCH REPORT

International Application No

PCT, JP 96/01746

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C11D17/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 236 136 (UNILEVER PLC ;UNILEVER NV (NL)) 9 September 1987 see the whole document ---	1-5
X	EP,A,0 132 726 (HENKEL KGAA) 13 February 1985 see the whole document ---	1-3
X	EP,A,0 507 404 (UNILEVER NV ;UNILEVER PLC (GB)) 7 October 1992 see page 2, line 40 - line 43 see page 2, line 56 see claims 1-7 -----	1

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

9 September 1996

Date of mailing of the international search report

17. 09. 96

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0236136	09-09-87	AU-B- 586075	29-06-89
		AU-B- 6963687	10-09-87
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		DE-A- 3785947	01-07-93
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